

Amendments to the Claims

This listing of claims will replace all prior versions of claims in the application:

1-107. (Canceled)

108. (New) A method for preparing a catalyst, the method comprising

forming a pre-calcination composition by a method that includes combining a Ni-component with a first minor component, and optionally with second and third minor components,

the Ni-component consisting essentially of Ni, a Ni oxide, a Ni salt, or mixtures thereof, the mole fraction of the Ni-component ranging from about 0.5 to about 0.96,

the first minor component consisting essentially of an element or compound comprising a member from the group consisting of Ti, Ta, Nb, Co, Hf, Y, Zn, Zr, Al, oxides thereof, salts thereof, and mixtures thereof, the mole fraction of the first minor component ranging from about 0.04 to about 0.5,

the second minor component consisting essentially of an element or compound comprising a member selected from the group consisting of a lanthanide element, a group IIIA element, a group VA element, a group VIA element, a group IIIB element, a group IVB element, a group VB element, a group VIB element, oxides thereof,

salts thereof, and mixtures thereof, the mole fraction of the second minor component ranging from 0 to about 0.4,

the third minor component consisting essentially of an element or compound comprising a member selected from the group consisting of an alkali metal, an alkaline earth metal, oxides thereof, salts thereof, and mixtures thereof, the mole fraction of the third minor component ranging from 0 to about 0.4, and

calcining the pre-calcination composition.

109 (New) A method for preparing a C₂ to C₄ alkene or a substituted C₂ to C₄ alkene from the corresponding C₂ to C₄ alkane or substituted C₂ to C₄ alkane, the method comprising

providing a C₂ to C₄ alkane or a substituted C₂ to C₄ alkane and a gaseous oxidant to a reaction zone containing a catalyst, the catalyst comprising Ni, a Ni oxide, a Ni salt or mixtures thereof,

maintaining the reaction zone at a temperature ranging from about 200 ° C to about 350 ° C, and

oxidatively dehydrogenating the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to form the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene in the reaction zone under reaction conditions effective to convert the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to the C₂ to C₄ alkene or substituted C₂ to C₄ alkene, the reaction zone comprising the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene in a molar concentration of at least about 5%, relative to total moles of hydrocarbon, during the

oxydehydrogenation, the C₂ to C₄ alkane or substituted C₂ to C₄ alkane conversion being at least about 5%, and the C₂ to C₄ alkene or substituted C₂ to C₄ alkane selectivity being at least about 50%.

110 (New) The method of claim 109 wherein the C₂ to C₄ alkane or substituted C₂ to C₄ alkane and the gaseous oxidant are co-fed to the reaction zone, the method further comprising

co-feeding a C₂ to C₄ alkene or substituted C₂ to C₄ alkene corresponding to the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to the reaction zone.

111. (New) The method of claim 109 wherein the C₂ to C₄ alkane or substituted C₂ to C₄ alkane and the gaseous oxidant are co-fed to the reaction zone, the method further comprising

exhausting a product stream comprising the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene and unreacted C₂ to C₄ alkane or substituted C₂ to C₄ alkane from the reaction zone, and

recycling at least a portion of the C₂ to C₄ alkene or substituted C₂ to C₄ alkene and unreacted C₂ to C₄ alkane or substituted C₂ to C₄ alkane containing product stream to the reaction zone.

112. (New) A method for preparing a C₂ to C₄ alkene or a substituted C₂ to C₄ alkane from the corresponding C₂ to C₄ alkane or substituted C₂ to C₄ alkane the method comprising

feeding a C₂ to C₄ alkane or substituted C₂ to C₄ alkane to a first reaction zone containing a catalyst, the catalyst comprising a calcination product of a composition comprising (i) Ni, a Ni oxide, a Ni salt or mixtures thereof, and (ii) an element or compound selected from the group consisting of Ti, Ta, Nb, Co, Hf, W, Y, Zn, Zr, Al, oxides thereof and salts thereof, or mixtures of such elements or compounds,

co-feeding a gaseous oxidant to the first reaction zone,

dehydrogenating the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to form the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene in the first reaction zone under reaction conditions effective to convert the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to the C₂ to C₄ alkene or substituted C₂ to C₄ alkene,

exhausting a product stream comprising the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene and unreacted C₂ to C₄ alkane or substituted C₂ to C₄ alkane from the first reaction zone containing the catalyst,

feeding the C₂ to C₄ alkene or substituted C₂ to C₄ alkene and unreacted C₂ to C₄ alkane or substituted C₂ to C₄ alkane containing product stream from the first reaction zone to a second reaction zone,

co-feeding a gaseous oxidant to the second reaction zone,

dehydrogenating the C₂ to C₄ alkane or substituted C₂ to C₄ alkane to form the corresponding C₂ to C₄ alkane or substituted C₂ to C₄ alkane in the second reaction zone.

113. (New) The method of claim 112, wherein the concentration of oxygen in the first and second reaction zones is controlled to obtain an overall C₂ to C₄ alkane or substituted C₂ to C₄ alkane conversion of at least about 5% and an overall C₂ to C₄ alkene or substituted C₂ to C₄ alkene selectivity of at least about 50%.

114. (New) The method of claim 112 wherein the molar concentration of oxygen in the first and second reaction zones ranges from about 3% to about 20%, in each case relative to ethane.

115. (New) The method of claim 112 wherein the second reaction zone comprises the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene at a molar concentration of at least about 5%, relative to total moles of hydrocarbon.

116. (New) The method of claim 112 wherein the C₂ to C₄ alkane or substituted C₂ to C₄ alkane is oxidatively dehydrogenated in the second reaction zone to form the corresponding C₂ to C₄ alkene or substituted C₂ to C₄ alkene with a C₂ to C₄ alkane or substituted C₂ to C₄ alkane conversion of at least about 5% and a C₂ to C₄ alkene or substituted C₂ to C₄ alkene selectivity of at least about 50%.

117. (New) A method for preparing acetic acid from substituted or unsubstituted ethane, the method comprising

providing substituted or unsubstituted ethane and a gaseous oxidant to a reaction zone containing a catalyst and a co-catalyst,

the catalyst comprising Ni, a Ni oxide, a Ni salt, or mixtures thereof and one or more components consisting essentially of Ti, Ta, Nb, Co, Hf, W, Zn, Zr, Al, oxides thereof and salts thereof, or mixtures thereof, and

the co-catalyst having activity to oxidize ethylene to acetic acid, and

dehydrogenating the substituted or unsubstituted ethane to form substituted or unsubstituted ethylene; and

oxidizing the unsubstituted or substituted ethylene to form substituted or unsubstituted acetic acid.

118. (New) The method of claim 117 further comprising providing an integrated catalyst composition comprising the catalyst and co-catalyst to the reaction zone.

119. (New) The method of claim 117 further comprising providing a single composition comprising the catalyst and co-catalyst to the reaction zone, wherein the catalyst and the co-catalyst are in separate phases.

120. (New) A method for preparing vinyl chloride from substituted or unsubstituted ethane, the method comprising

providing substituted or unsubstituted ethane and a gaseous oxidant to a reaction zone containing a catalyst and a co-catalyst,

the catalyst comprising Ni, a Ni oxide, a Ni salt, or mixtures thereof and one or more components consisting essentially of Ti, Ta, Nb, Co, Hf, W, Zn, Zr, Al, oxides thereof and salts thereof, or mixtures thereof, and

the co-catalyst having activity to chlorinate or oxychlorinate ethylene to vinyl chloride, and

dehydrogenating the substituted or unsubstituted ethane to form substituted or unsubstituted ethylene; and

chlorinating or oxychlorinating the unsubstituted or substituted ethylene to form substituted or unsubstituted vinyl chloride.

121. (New) The method of claim 120 further comprising providing an integrated catalyst composition comprising the catalyst and co-catalyst to the reaction zone.

122. (New) The method of claim 120 further comprising providing a single composition comprising the catalyst and co-catalyst to the reaction zone, wherein the catalyst and the co-catalyst are in separate phases.